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Skylab Altimetry  
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Preliminary pulse shape analysis of data in pass 1 (SL-2) and passes 17, 18 and 28 (SL-3) has been completed. Typical waveforms from flat areas show a sharp drop-off of the trailing edge that confirms the initial conclusion from statistical analysis of a strong specular component in the radar return. The waveform of the radar returns from complex areas on the other hand have almost flat trailing edges. This type of waveform behavior is further emphasized in submode 2 where the antenna angle is tilted 1/2 degree in pitch off nadir.

Refined Skylab orbit data is expected to be received from J. McGoogan of Wallops in March 1974 for passes 28, 17, and 18 of SL-3 which will permit complete topographic analysis of these passes.

Enclosed is a summary of an oral presentation given at NWL, Dahlgren, Virginia on March 29, 1974 on "Initial Results of Skylab Altimeter Observations Over Terrain." An abstract has been sent previously to L. York, Houston, Texas.

## INITIAL RESULTS OF SKYLAB ALTIMETER OBSERVATIONS OVER TERRAIN

### Summary:

The narrow pulse radar altimeter of the Skylab EREP package (S-193) was operated over land areas to evaluate the capability of an altimeter as a sensor of topographic and physical properties of sub-satellite solid reflecting surfaces. Observations were obtained over a variety of terrain of the U.S.A. and the received power, pulse shape, range and statistical characteristics of the radar return determined as a function of the sub-satellite position. While the design of the 2.16 cm Skylab altimeter allowed for the large dynamic range in power level that was received from different types of terrain, the smoothing operation of the altimeter AGC and range tracker loop (designed for ocean scatter) limited the altimeter measurements to large scale homogeneous areas where no rapid changes in reflected power or range were present.

The initial results indicate that:

1. The received power is primarily determined by the geometry and roughness of the observed terrain and extends by more than 50 db in dynamic range as the sub-satellite areas change from smooth areas such as salt flats, deserts and lakes to complex and rough regions such as mountains and forests.

2. The large received power from flat areas (about 25 db above the ocean return) is produced by a dominant specular reflection that can be deduced from narrow pulse return.

3. Some specular components are present in radar returns from cities, valleys and hills, but this type of reflection decreases as vegetation and forests become more prevalent.

4. The ability to detect strong specular radar returns provides a potential resolution of a few hundred meters compared to the pulse width limited spot size of several km.

5. In areas where extended vertical structure exist, the maximum reflection appears to occur nearly always at the lower heights.

From these preliminary results it appears that a satellite radar altimeter can provide a two-dimensional array of reflectivity and range both in the z and x direction as the sub-satellite point travels along the x dimension.